## Appendix

**Supplementary Table 1.** Model selection for the fixed effect structure of linear mixed effect models (based on maximum likelihood estimation) for total SOC stock, organic horizon SOC stock and mineral horizon SOC stock (Mg ha-1). The selected models are in bold. Random effect structure is always the same (~1|Pit number). Selection was based on AIC = Akaike’s information criterion, the lowest value was selected. P is the p-value based on likelihood ratio tests (Chi squared) between two models, P < 0,05 was accepted as a sufficient significance level. Steps show different models and Step. comp. indicates which models were compared.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Dependent variable | Step | Fixed effects | Df | AIC | P | Step comp |
| Total SOCst | 1 | Forest age\* Ancient forest vs grassland | Model is overparametrized, for the given amount of independent measurements | | | |
|  | 2 | Forest age+ Ancient forest vs grassland | 15 | 212.91 |  |  |
|  | 3 | **Forest age** | **16** | **212.25** | **0.01** | **2 vs. 3** |
|  | 4 | Ancient forest vs grassland | 17 | 218.07 | 0.24 | 2 vs. 4 |
|  | 5 | Null | 18 | 216.56 | 0.01 | 3 vs. 5 |
| ln(Organic SOCst) | 1 | Forest age \* Horizon location \* pH | Model is overparametrized, for the given amount of independent measurements | | | |
|  | 2 | Forest age \* Horizon location+ Horizon location \* pH + pH \* Forest age | 13 | 43.69 |  |  |
|  | 3 | Forest age \* Horizon location + pH\* Forest age | 11 | 43.78 | 0.148 | 2 vs. 3 |
|  | 4 | Forest age \* Horizon location | 9 | 43.44 | 0.129 | 3 vs. 4 |
|  | 5 | **Forest age + Horizon location** | **7** | **41.04** | **<0.01** | **4 vs. 5** |
|  | 6 | Forest age | 6 | 89.05 | <0.01 | 5 vs. 6 |
|  | 7 | Horizon location | 5 | 46.06 | 0.011 | 5 vs. 7 |
| ln(Mineral SOCst) | 1 | Forest age \* Horizon location \* pH\*Clay | Model is overparametrized, for the given amount of independent measurements | | | |
|  | 2 | Forest age \* Horizon location + Horizon location \* pH + Forest age \* pH + Clay \* Forest Age + Clay\*pH + Clay \* Horizon location | 23 | 62.02 |  |  |
|  | 3 | Forest age \* Horizon location + Horizon location \* pH + pH \* Forest age + Clay\*Forest Age + Clay\*pH | 21 | 81.32 | <0.01 | 2 vs. 3 |
|  | 4 | Forest age \* Horizon location + Horizon location \* pH + Forest age \* pH + Clay \* Forest Age + Clay \* Horizon location | 22 | 64.46 | 0.035 | 2 vs. 4 |
|  | **5** | **Forest age \* Horizon location + Horizon location \* pH + Forest age \* pH + Clay\*pH + Clay \* Horizon location** | **21** | **58.54** | **0.771** | **2 vs. 5** |
|  | 6 | Forest age \* Horizon location + Horizon location \* pH + Clay\*pH + Clay \* Horizon location | 19 | 74.99 | <0.01 | 5 vs. 6 |
|  | 7 | Forest age \* Horizon location + Clay\*pH + Clay \* Horizon location | 19 | 68.69 | <0.01 | 5 vs. 7 |
|  | 8 | Horizon location \* pH + Forest age \* pH + Clay\*pH + Clay \* Horizon location | 15 | 73.13 | <0.01 | 5 vs. 8 |
|  | 9 | Horizon location \* pH + Forest age \* pH + Clay \* Horizon location | 20 | 70.5 | <0.01 | 5 vs. 9 |

R code for statistical analysis and measurement dataset are provided in this repository:

<https://github.com/ritarazauskaite/Glenmore_forest_data_and_stats>



**Supplementary Figure 1.** Podzolic soil profile under pine forest with horizon names.

**Supplementary Figure 2.** Cambisole soil profile under grassland with horizon names.